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WEAVING THE NET: LINKING SPACE SYSTEMS TO THEATER OPERATIONS

by

Robert D. Critchlow
Major, USAF

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Maritime Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _~Robert D. Critchlow~_

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ROGER W. BARNETT
Professor, Naval War College

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Joint Vision 2010 visualizes a military in which the principle of mass is redefined through information superiority. Information superiority is achieved through a shift toward "network centric warfare." The information grid which enables network centric warfare can be achieved only through heavy reliance on space based assets. Only space based communications can meet the needs of forces deploying from CONUS to remote locations that lack indigenous communications infrastructures. These assets must be military, as commercial systems present limitations that will not be overcome except in the gravest of contingencies.

Existing constraints prohibit space systems from completely fulfilling the dream of "bandwidth on demand" required to implement the JV2010 operational concepts. Technical limitations cap the capability of existing satellite constellations. More importantly, organizational inefficiencies hamper the joint force commander's ability to maximize support from these resources. Exploiting existing unified command structures, by centralizing authority to apportion MILSATCOM resources by mission need under USSPACECOM, could provide meaningful improvements.

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Abstract of

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Joint Vision 2010 visualizes a military in which the principle of mass is redefined. Mass in 2010 will be characterized by the massing of effects, rather than mass derived by way of a superior number of people or platforms. Information superiority, by enabling dominant battlefield awareness, is the key to achieving this redefinition. Information superiority is achieved in the military in the same way it is being achieved in the civilian sector: through a shift away from expensive and centralized platforms toward a distributed information architecture. "Network centric warfare" relies on a pervasive information grid that provides the nervous system that links sensors and shooters.

The information grid can be achieved only through heavy reliance on space based assets. Joint forces already lean upon satellites to support their communication needs, as seen in Desert Storm. Only space based communications can meet the needs of forces deploying from CONUS to remote locations that lack indigenous communications infrastructures. It is unlikely that theater commanders will have the time to establish ground based communications in a fast moving crisis. These assets must be military, as commercial systems present limitations that will not be overcome except in the gravest of contingencies.

Unfortunately, existing constraints prohibit space systems from completely fulfilling the dream of "bandwidth on demand" required to implement the JV2010 operational concepts. Technical limitations cap the capability of existing satellite constellations. More importantly, organizational inefficiencies hamper the joint force commander's ability to maximize support from these finite resources. Exploiting existing unified command structures, by centralizing authority to apportion MILSATCOM resources by mission need under USSPACECOM, could provide meaningful improvements.

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> Communications dominate war; broadly considered, they are the most important
> single element in strategy, political or military.
>
> Alfred Thayer Mahan[1]

While the nineteenth century sage of naval warfare was talking about physical communications, as was appropriate in his time, his maxim continues to apply today in this age of "virtual" lines of communication. Where Mahan wanted to provide for the transit of things, the critical commodity to move today in support of warfare is information. For today's joint warfighter, these lines of communication must pass through space. Space systems are information assets.

Spacepower's information and communications roles are not the focus of most forward looking thought about the purpose of space forces. Most writing about the military role of space focuses on futuristic missions such as space control and force application from space against the terrestrial battlefield. Lt Col David Lupton's On Space Warfare, and Lt Col Michael Mantz's more recent The New Sword: A Theory of Space Combat Power are examples of this spreading genre. Air University's Spacecast 2020 study examines such eclectic missions as offensive counter-space, counter-force weather control, and planetary defense.[2] While it is of course vital that the military incubate visionaries and forward looking ideas, the joint force commander looks for improved support from space in the near term and cannot wait for the age of "Babylon 5"-like capabilities.

Spacepower makes a crucial difference in the effectiveness of joint forces. The surveillance, navigation, and warning capabilities that space brings to the commander's toolbox already assume critical roles. Today's tests that validate reconnaissance strike complex concepts show where space warfare is going in the near term. Space-based communications provide the backbone that unites all of these capabilities. The advanced command, control, and communication (C^3) capability that space brings to the table enables the information superiority

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that is the basis for the framework guiding the Chiefs' <u>Joint Vision 2010</u>.

In order to maximize the capabilities that space based communications provide the joint warfighter--in terms of an "information grid" that is the key enabler to the information superiority on which <u>Joint Vision 2010</u> relies--this paper will demonstrate that military forces must reorganize in a manner that paradoxically centralizes management of space based communications while the organizations that rely on the information net decentralize. Examining the symbiosis between the 2010 vision, the drive to achieve information superiority, and the role of the information grid prepares a framework for analysis. Perusing the past and future role of military satellite communications (MILSATCOM) demonstrates its indispensable role as the key component of the information grid. Unfortunately, the current scheme for employing and apportioning these assets places roadblocks in the path to the information grid vision. However, solutions--more organizational than technical--could be implemented which would move into the fast lane towards approximating the information grid ideal.

A Vision of Information Superiority

The Joint Chiefs' of Staff vision for the future of joint military operations, <u>Joint Vision 2010</u> (hereafter, <u>JV2010</u>) explicitly relies on information superiority to increase the effectiveness of joint forces in war and in operations other than war. <u>JV2010</u> presumes a near term military in which joint force commanders fulfill the principle of mass through massed effects of weapons systems without the need for massing forces to attack. The new operational concepts of precision engagement, dominant maneuver, full dimensional protection and focused logistics anticipate technological advances in command, control, communication, and intelligence (C^3I). These advances allegedly will permit information superiority and ultimately serve as the foundation for the entire <u>JV2010</u> framework.[3]

This information superiority leads to a new ability of "dominant battlespace awareness" that promises improved situational awareness and decreased response time. The new

information technologies ensure decision makers have more timely and complete information than ever in the history of warfare. The faster decision making and increased situational awareness thus provided will reduce risk to the joint force and accelerate execution of more operational tasks. This information technology also allows the passing of data to many locations, thus enhancing small unit fighting power. More self reliant small units drive increased mobility and dispersion and this dispersion further requires enhanced communications. While execution thus becomes more decentralized, planning becomes more centralized at remote and secure locations.[4]

Information superiority and dominant battlefield awareness are critical factors permitting the institutionalization of the new operational concepts that JV2010 proposes. The advanced C^3 will enable dominant maneuver by permitting simultaneous application of combat power and increased integration of forces and capabilities. This ability makes possible coordination and synchronization of dispersed units. In turn, this dispersion leads to more agile operations and increases the operational tempo. New C^3 capabilities permit precision engagement through enhanced connectivity between sensors and shooters. This connectivity links intelligence, surveillance, reconnaissance, target acquisition, and command and control (C^2) and so allows nearly instantaneous responses against targets.[5]

Information superiority is also key to the support related operational concepts of full dimensional protection and focused logistics. C^3 improvements support full dimensional protection through increased dispersion that reduces risk to forces in the field. They also provide the means for fast understanding of risky situations and prompt dissemination of threat information to all forces. Finally, improved C^3 technology enables focused logistics by integrating operators, planners, and logisticians in a networked environment that reduces planning time, allows more refined estimates of deployment packages, and increases flexibility of the logistics flow.[6]

What technological architecture underlies the information superiority and dominant battlefield awareness advances assumed in JV2010? The world of JV2010 envisions

information superiority composed of a ubiquitous regime that integrates information systems, relevant information, and information operations. The new systems it anticipates create potential for instant worldwide information exchange. This form of battlespace information system would mix broadcast "push" of information and warrior specific "pull" of information.[7]

The fundamental concept is "network centric warfare," as illustrated in the writing of Vice Admiral Arthur Cebrowski and Dr. John Garstka. Network centric warfare shifts the emphasis of activity from the weapons platforms to the networks that interconnect them. In this concept military actors comprise part of an overall interconnected military "ecosystem" rather than functioning as independent elements. This network concept is exemplified in the civilian world's shift from platform centric "mainframe" computing to network centric computing as seen in the internet and its ability to create, distribute, and exploit information.[8]

In Admiral Cebrowski and Dr. Garstka's vision, network centric warfare increases joint combat power by shortening timelines and thus locking out enemy options early. The greatest change to warfare occurs in the initial campaign phases with this promise of dramatic early results. Network centric warfare enables increased speed of command by creating a closer linkage among units and through information superiority permitting massing of effects. Network centric warfare leads to self-synchronization of operations because organizations rely on bottom-up rather than top-down direction. Questions decrease and collegiality increases because technology enables institutional replication of the mutual understanding seen historically in close knit command organization such as Admiral Nelson's famous "band of brothers." This mutual understanding shortens operational timelines. Combat power increases with increased battlespace awareness and speed of command, rather than increased numbers of platforms. [9]

The network centric warfare architecture which Admiral Cebrowski and Dr. Garstka envision will consist of sensor grids for battlespace awareness, engagement grids that apply combat power, and information grids to provide connectivity. Of particular interest to this discussion is the pervasive information grid that would serve as the communications and

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computer support structure undergirding the network centric warfare architecture. The information grid would supply a secure communications and computers backbone that connects sensor and engagement grids by delivering dial tone, "web tone", and "data tone" services.[10]

However, like the video arcade "shoot-em-up" game in which the player has "infinite" bullets, the information grid concept assumes bandwidth on demand. Dr. Garstka recognizes that precision weapons generate an increased information demand. Examples of this demand include targeting data, bomb damage assessment (BDA), and mapping information. He admits that existing data "pipes" are not big enough. His information grid presumes larger pipes to provide sufficient capacity. Unfortunately, he does not explain how to achieve that capacity.[11]

The Advanced Battlefield Information Systems (ABIS) task force study examined ways to achieve the network centric warfare reality. This Department of Defense study identified key technologies to develop in order to achieve the vision of a single global information grid that connects all warfighters. It proposes a three tier framework for the effort: force employment concepts, battlespace awareness capabilities, and technologies for a seamless information grid. In the near term, it proposes research into tactical and mobile networking to support the grid. In the long term, it looks to enhance grid services through distributed access technologies and predictive grid management. However, the long term initiatives that are key to the full fruition of the information grid would extend past 2010 and thus presuppose technologies that would only enter the force as proven capabilities beyond the JV2010 horizon.[12]

Space Based Communications: The Backbone of the Information Grid

Any proposal for a pervasive information grid that can support joint warfighters wherever they might deploy must place heavy reliance on space based communications assets. Arguably, without MILSATCOM, the entire JV2010 world view falters. The JV2010 follow-on study recognized that the increased use of space systems enhances information systems and capabilities thus enabling dominant battlespace awareness.[13] General Howell M. Estes III,

commander of U. S. Space Command, summed up the reality, "Joint Vision 2010 cannot be implemented without the capabilities space forces bring to the table. . ."[14]

The vital role space based communications played in Desert Storm exemplified the depth of the reliance on these systems and presaged the increased dependence to come. Satellite communications provided 90% of intra-theater and inter-theater communications during Desert Shield and Desert Storm.[15] The Persian Gulf theater's lack of an indigenous communications infrastructure exacerbated this dependence on satellite communications. In addition to "long haul" communications, satellites provided tactical links within the theater and permitted bridges for radio systems to operate beyond line of sight. Satellite communications were key in enabling unity of command in a diverse joint and multinational force. They extended the scope of the battlefield and enabled around-the-clock continuous operations. They were indispensable for coordinating air, land, sea, and space operations into a synchronized campaign, the goal of any joint force commander.[16]

Space systems were taxed to their limits during the conflict with Iraq. The Defense Satellite Communications System (DSCS) super-high frequency (SHF) support grew from two to four vehicles supporting the theater, from a pre-conflict 70 to a maximum of 1100 voice circuits, and from 4.5 Mb/s to 68 Mb/s. This growth was only possible because of judicious retargetting and repositioning of satellites. Part of the growth was attributable to the need for this strategic system to supplement tactical communications supplied by ultra-high frequency (UHF) systems. The primary suppliers for UHF capability were three FLTSATCOM/LEASAT vehicles. A major constraint on the ability of satellites to support the joint commander was the time required to move terminals to the theater and to reconfigure and reposition satellites to provide communication to the region.[17]

Growth also occurred over commercial providers. A 50% growth in traffic took place on INMARSAT during the January to March 1991 period despite the flight of commercial shipping from the region. One might thus assume this increase was military traffic. INTELSAT also noted growth, but mostly due to television traffic. This foreshadows a future

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competitor against the joint force commander for finite bandwith.[18]

A few specific examples highlight the ways in which satellite communications gave coalition forces the critical combat edge against the Iraqi adversary. Satellite communications ensured connectivity between CINCENT and the National Command Authorities (NCA). SCUD missile launch warning from NORAD to Patriot shooters over communications satellites focused resources and increased the effectiveness of the ballistic missile defense. In an early example of space-based "sensor to shooter" links, satellites relayed pilot observations to fielded ground forces. In the expansive Iraqi desert, space based communications permitted synchronization of maneuver and massing of fires in ground war. Satellite communications even fulfilled the humble task of supporting supply coordination for the forward deployed 82d Airborne Division.[19]

One might wonder, in this post-Gulf War fiber optic era, why high bandwidth land lines could not fulfill the needs of a joint force commander in lieu of expensive MILSATCOM systems? In <u>Joint Forces Quarterly</u> ,the commander of the U.S. Space Command, General Estes, recently emphasized space forces capability to provide rapid access and presence worldwide. Forces executing engagement missions in regions without indigenous communications infrastructures, due either to its destruction in conflict or the remoteness of the locations, will be tied to space based communications. Space based communications are the preferred means for forward deployed Naval forces, which tend to be first on the scene of a crisis. For the Navy, hardwired communications are not an option. The pullback of US forces from overseas forward bases will further the reliance on space based communications. This new mode of operations now assumes combat forces deployment to the crisis region while leaving heavy support infrastructure in CONUS. The experience of Desert Shield/Storm highlighted the problems with attempting to establish a ground based communications infrastructure, as there was insufficient lift available to deploy ground based switching and trunking from the states. These systems only became available near the end of the war. In the future, it is unreasonable to expect six months to ramp up a communications infrastructure in

theater. Forces will be fortunate to have six days to establish themselves.[20]

Only space based communications can support C^2 capabilities needed in the fast and fluid combat environment anticipated for future conflict. Advances such as Real Time Information to the Cockpit (RTIC) depend on clear satellite communications and are crippled without it. Thus, the information grid envisioned by Admiral Cebrowski, Dr. Garstka, and the JV2010 community primarily will be a space grid.[21]

The space based components of the information grid currently provide a mix of SHF, UHF, and extra-high frequency (EHF) capabilities to a variety of strategic, operational, and tactical users. However, these systems now serve as separate elements of multiple space based communications networks. The DSCS constellation provides multi-channel SHF communications. It serves as the backbone for high capacity applications such as C^2 and intelligence support for users such as the National Command Authorities, State Department, and Department of Defense. It is composed of five primary and five backup satellites to support tactical users, deployed warfighters, and capital ships. It is oriented for support of forward deployed forces rather than supply of long haul service.[22]

The FLTSATCOM, UHF Follow-On (UFO) and LEASAT programs provide UHF communications. These systems cover the region between 70°N and 70°S Latitudes, with 2 satellites each for the CONUS, Atlantic Ocean, Indian Ocean, and Pacific Ocean areas. These supply low-capacity, long-haul communications such as point-to-point, broadcast, and netted single channel applications.[23]

The MILSTAR constellation and certain FLTSATCOM and UFO vehicles fitted with EHF transponders supply EHF communications. MILSTAR was originally designed for warning and control of strategic forces, but it is also used for medium data rate communications for deployed operational forces, including Army echelons below corps. The Air Force expects the complete constellation to be on orbit by 2003.[24]

The NATO 4/SKYNET 4 constellation, owned by NATO and the British Royal Air Force (RAF) respectively, can also provide SHF communications, as it did during Desert

Storm.[25] However, use of these systems requires NATO or United Kingdom Ministry of Defense approval, which may be difficult to obtain for out-of-area conflicts. Further, it is unlikely that NATO or the RAF will permit repositioning of these vehicles; therefore, they can provide support only within their North Atlantic footprint.[26]

Impediments to the Space Grid

A look at the near term reality of space based communications indicates that "bandwidth on demand" required by the information grid is not achievable given the architecture that will exist through the 2010 time frame. The reality is that, while there are some technical bottlenecks, the more serious concern is organizational. A collection of systems is not a network.

What is a network? The terms "network" and "network centric warfare" are fast becoming mandatory buzzwords. A quick peek at the fundamental concept will set the stage for understanding the speed bumps slowing progress toward the space based information grid.

Fundamentally, a network exists with the interaction of two or more elements. It is useful to portray a network as the interaction between sets of links and nodes. Alternatively, a network consists of a set of users or subscribers and a system that provides useful service. A network can be physical, for moving things, or communications, for moving information.[27]

In building successful networks, bigger is better. First, size equates to power, reflected in Metcalfe's law: "The power (value) of a network increases as the square of the nodes in the network (N^2)."[28] Second, the dispersion inherent in a network can provide wide area coverage that can increase detection power for sensors or put information where it can be useful. Third, larger size leads to increased robustness. Distributed systems are more robust against failure, through their increased redundancy and survivability.[29]

Unfortunately, the finite capacity and limited constellations of the current space based systems might throttle the information grid of the future and so constrain the power and robustness of the network. General Estes stated, "Precision strike, dominant battlefield

awareness, and sensor-to-shooter require more information transfer and satellite capacity than we now provide."[30]

The DSCS constellation is approaching the end of its life. The last of the DSCS II vehicles that provided additional capacity for Desert Storm will be retired within a year. The oldest of the more capable DSCS III vehicles was launched in 1983, and has already exceeded its projected service life. Only four more satellites remain available for launch as replacements for the constellation. Worse, there is no follow-on program in design to replace DSCS. Given the heavy reliance joint warfighters place on this resource, this is a dire situation indeed.[31]

Despite the launch of additional UFO vehicles to augment and replace the aging FLTSATCOM and LEASAT constellations, joint operations are stressing UHF capabilities. UHF systems suffer from limited access and limited throughput for the high bandwidth applications required to provide sensor-to-shooter connectivity. UHF systems in Desert Storm were not up to the needs of mobile forces for high data rate communications applications, such as imagery. Only DSCS-SHF could meet the need. EHF systems might substitute in the future, but these are currently optimized for other tactical needs.[32]

EHF systems will be unable to fill this communications deficit. The MILSTAR constellation will not be as big as planned. The initial concept for 18 vehicles was down-sized to 6 in the wake of the Cold War and the consequent devaluing of MILSTAR's nuclear survivability requirements. As budgets continue to shrink, the Air Force is looking at deferring the launches of vehicles five and six.[33]

One might hope that it would be possible to add to these assets in the event of a crisis. However, in the vast majority of short-notice fast-moving contingencies, that is unlikely. Repositioning a satellite from another location to support the theater commander is a serious and time consuming proposition. A control crew can start the vehicle on its way within hours of receiving the order. However, it typically takes several weeks for the satellite to arrive at its new station due to restrictions on its drift rate because of structural considerations and fuel consumption limitations. The decision to move a vehicle requires careful consideration, as the

loss of fuel burned in such moves can take years off a satellite's service life. The much-hyped concept of "launch on demand" in the event of a crisis is a chimera. The minimum timeline appears to be about 60 days, as exemplified by the case of a Global Positioning System/Delta II combination, given that the components are already at Cape Canaveral awaiting assembly. The ten months needed to marry a reconnaissance payload with a Titan IV booster seems to be more common. That timeline will lengthen further if the components are not already at the launch range or if there are problems with the booster or payload. In one recent case, a Titan IV was on the launch pad so long that General Charles Horner, then commander of Air Force Space Command, suggested painting a building number on the side of the booster.[34]

Given the existing technical limitations on MILSATCOM, the US military will need to be able to make the most of a finite resource. However, it is not bureaucratically well postured to do this. The promulgators of JV2010 recognized the importance of integrating information technologies into organizational structures. Unfortunately, the joint force commander must surmount a labyrinthine set of bureaucratic layers and rice-bowls to obtain the communication support needed to support theater operations.[35]

Systems serve different communities and are not interlinked to gain network advantages. What currently exists are multiple, "mini-networks" as seen above: SHF, UHF, EHF, and also commercial support. Using Metcalf's law, assuming the 110 DCSCs terminals that represented the Gulf war maximum and the four vehicles available to support the region, the network "power" quotient is 12996 nodes-squared. The 2000 UHF users matched with the three UHF vehicles available to support the region represent a network "power" quotient of 4012009.[36] However, if the two networks are linked completely together as a single network, the "power" quotient rises to 4481689, nearly 35000% more "powerful" than the SHF network alone, and about 12% more powerful than the UHF network alone. This sort of increase may well prove to be vital given the projected increases in requirements envisioned by JV2010. It would seem to be inherent in the concept of a pervasive "information grid" that Admiral Cebrowski and Dr. Garstka propose. This would require a move toward a real time

optimization of available assets.

One might assume that the new Global Command and Control System (GCCS) would fulfill this role. In reality, all GCCS does is provide a common platform to host multiple preexisting C^4 applications, such as the Joint Operational Planning and Execution System (JOPES) and the Joint Deployable Intelligence Support System (JDISS). The communications "pipes" along which data for these applications flows is unchanged.[37]

The roadblock preventing optimization is not technical. It is bureaucratic. The Joint Force Commander, or his J-6, who requires MILSATCOM support for crisis operations, must currently navigate a multi-layered bureaucracy in order to fulfill his requirements. He must first decide what "flavor" of communications he wants: SHF, UHF, or EHF. That will determine whom he asks for support. For SHF communications, he will go through the Army to the Defense Information Systems Agency (DISA), which manages the DSCS constellation. For UHF communications, he would go through the Navy to the FLTSATCOM and UFO managers at the Norfolk Joint Communications Station. For EHF communications beyond that currently allocated to him on MILSTAR by the Joint Staff, he must approach his neighboring regional CINCs hat-in-hand and attempt to "horse trade." If he is unsuccessful, he can raise the problem to the Joint Staff's J-6Z division, which "referees" the dispute. The JFC or J-6 will have to overcome a slow and bureaucratic decision making process that allocates channels against high priority user standing requirements that are seldom used and not reviewed. Fundamentally, channels are allocated by user, not by operation. There is no communications equivalent of an "Air Tasking Order."[38]

Perhaps the reliance on military communications satellite assets is the problem. Most future visions confronted with the bandwidth dilemma assume increased reliance on commercial satellite communications. Certainly, the Defense Department transfer of support services to civilian contractors will increase the employment of commercial solutions. DISA awarded the Commercial Satcom Initiative, a contract for bulk commercial communications satellite capacity, in July 1995. However, the costs of using these services must be folded into

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crisis or contingency planning. Further, commercial systems might not meet the need due to legal and practical restrictions. INMARSAT has restrictions on its use by combatant forces. The US owns only 20% interest in the 33 satellite INTELSAT consortium, and the president has emergency powers over only 20% of that. Military users must compete with commercial users for bandwidth. During the Gulf War, much of the growth in use on the INTELSAT system was due to television broadcasting. Any crisis that will draw the military would likely also draw media users competing for the same space. It would seem probable that an extreme emergency would be required to deny the media its piece of the communications pie in theater.[39]

The projected Iridium, Teledesic, and Globalstar Low Earth Orbiting communications satellite constellations might be thought to offer a solution.[40] Indeed, the military would be wise to buy into capacity on these systems. However, given their target audience--the cell-phone, paging, fax, and internet community--and the rapid rate of growth of this civilian segment, the military should expect to find itself competing with users who the government will be reluctant to "bump off" except in the greatest of emergencies. The problem of the Global Positioning System (GPS) navigation satellite constellation illustrates a parallel dilemma. The civilian use of GPS has become so pervasive that it has become virtually impossible to activate the system's features that would deny its use by an adversary. A US corporation that relies on GPS has even threatened to sue the Air Force for loss of revenues during a past GPS downtime.[41] It is easy to extrapolate a similar dilemma for Iridium and its sisters if it becomes as popular as projected.

Commercial assets will not completely fill the need. General Estes argued that the commercial sector cannot meet certain particular military requirements, which include polar regions coverage, service for open oceans and remote areas, support of highly mobile users, and protection from jamming, interception, and detection.[42] Limitations on military use of commercial systems and competition for bandwidth will further curtail the military's ability to rely heavily on these assets, except in exceptional emergencies.

Casting the Net Wide: Organization for Exploitation

Systematic and organizational considerations thus remain as the main obstacles to overcome in creating the pervasive information grid envisioned by network centric warfare and central to JV2010 operational concepts. Rethinking both the process for managing space based communications resources and the DoD organization for managing these assets points the way toward solutions.[43]

First, it might be possible to reexamine how best to match assets against users. As noted above, tactical users traditionally exploit UHF, while higher organizational level users exploit SHF and now EHF, regardless of the type of data they are passing. With the growth of "sensor-to-shooter" requirements, data requirements for even lower level users are increasing dramatically, despite finite resources. Efficient management can increase the amount of data these assets pass. The need is for real time optimization of assets against users. Most satellite communications links are time-division multiplexed.[44] Therefore, the number of times a given carrier channel is "chopped up" determines the bandwith available to each user. As the number of possible links available to users increases in a larger and more united network, it becomes possible to apportion the links so that high bandwith data requirements, such as video-teleconferencing or reconnaissance image transmission, can be passed more easily over high frequency assets such as SHF or EHF, rather than simply being divided into many low quality channels optimized for voice communications. What is needed to achieve this goal is the equivalent of an "Air Tasking Order" for MILSATCOM. Communications channels could thus be apportioned according to mission requirement, just as the Joint Forces Air Component Commander apportions air sorties by mission type.[45]

Second, combining the multiple space based communications assets into a united and pervasive network requires increased centralization of the management of that network, even as the operational level of war moves to the less centralized and more dispersed operations that an information grid would permit. In order to achieve the real time optimization discussed above, a single authority should pool and manage military satellite communications assets. DISA's

charter should focus on systems acquisition and standardization across services. Joint Staff J-6 should not fulfill this role because legislation bars it from executing operations.[46]

USSPACECOM is the organization that should receive this responsibility. USSPACECOM, as a combatant commander, has legal authority to execute operations. Unified command planning already tasks USSPACECOM as a supporting CINC for other space based resources, such as warning and navigation. It would be equally logical to task USSPACECOM to provide space based communications support. USSPACECOM already has OPCON over the satellite bus. This would merely be a matter of including authority over the payloads. Combining the management for these systems would not only streamline the process for the joint warfighter, but would also have the bonus effect of contributing to the efficiency in government initiatives of the Gore Commission. USSPACECOM J-6 could then provide one stop shopping for satellite communications for the theater commander. A very senior officer from USPACECOM, speaking recently in a non-attribution forum, endorsed the need to break up the stovepipes that currently hamper space communications management and focus this effort in USSPACECOM. Thus, USSPACECOM would move farther down the road of unified command maturity as it overcomes another layer of bureaucratic legacy.

Such a reorganization would certainly run up against opposition from that bureaucratic legacy. Other services, particularly the Army which dominates DISA, might well express concern about the ramifications which such a move would mean to them. They could worry that USSPACECOM, which is co-located with the Air Force's Space Command and dominated by the Air Force, might not be as responsive to their needs as is DISA. Certainly they might object to the decreased participation in space operations, one of the rare areas of defense budget growth, or at least stability, that this change would entail. Further, the increased manpower upon which this reorganization would rely will be harder to obtain as the services move to reach the targets of the Quadrennial Defense Review.

Although military culture is beyond the scope of this paper, a warning is in order. These solutions work only if the right people are available to implement these ideas. Admiral

Cebrowski sagely warns that the military will need to undergo a cultural change to reap the full rewards of network centric warfare. The military must reward expertise in information systems as the network surpasses the weapons platform in importance. All services will need to mainstream information grid experts as the "new operators" or these people will leave the military, hamstringing the race to 2010.[47]

Conclusion

Joint Vision 2010 offers a concept for joint warfighting that enhances the military forces power by exploiting the advances of the information revolution to achieve information superiority and dominant battlespace awareness. Network centric warfare provides an architecture on which to build information superiority. The information grid provides the backbone for the network centric warfare architecture. Without the information grid, Joint Vision 2010 is impossible.

Without the exploitation of space based communication assets, the information grid can not happen. However, the degree to which MILSATCOM can support the information grid is handicapped. This handicap is more bureaucratic than technical. In order to maximize the effectiveness of a finite resource, satellite communications, the management of communications satellite payloads should be centralized under CINSPACE to permit increased efficiency of apportionment that brings the United States closer to the "network centric warfare" ideal as the U.S. military progresses on its odyssey to 2010.

END NOTES

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[31] This author has supported the command and control of both the DSCS II and DSCS III constellations since 1985, with service in both the 3d Space Operations Squadron and the 5th Space Operations Squadron.

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[33] Roos, 12-16.

[34] Joseph C. Anselmo, "Launch Upgrades Key to Milspace Evolution," Aviation Week and Space Review, 1 September 1997, 48.

[35] Concept for Future Joint Operations, 24-6.

[36] Anson and Cummings, 122-3.

[37] Joint Pub 6-02, IV-3, IV-6; CAPT Don Slayton, USN, Division Chief, Joint Staff C^4 Space Systems Division, telephone conversation with author, 7 January 1998.

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[41] This incident observed during author's tenure at the 5th Space Operations Squadron.

[42] Estes, "Sustaining the Strategic Space Advantage," 9.

[43] Of course, another way to increase the bandwith available would be to increase resources. Clearly, a more capable follow-on to the DSCS constellation is needed. It would also seem prudent to not curtail the MILSTAR constellation further, as is under consideration. However, procurement questions such as these are beyond the scope of this paper.

[44] Author's thanks to his friend, Mr. Phillip M. Hanna, at the National Air Intelligence Center, for this insight and technical explanation.

[45] The author is indebted to Lt Col Earle at the Joint Spectrum Center, who initially suggested this concept.

[46] Armed Forces Staff College, <u>The Joint Staff Officer's Guide, 1993</u> (AFSC Pub 1), 2-13 to 2-14

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